CONCEPT CLASSIFICATION FOR STUDY PROGRAMS QUALITY EVALUATION

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Abstract: The article describes the form of recording the study courses in the University of Latvia and the drawbacks in the records of the study courses are indicated, which hinder tracing the quality control of the study program. The solution offered by the authors is described, using the concept classification in describing the study course topics. Concept classification, when combined with the modifications in recording the topic acquisition information, would facilitate the processing of the study program in the context of quality control. The article enumerates the most significant gains, which would be achieved by the changes in the method for registering the study courses as offered by the authors, which would further facilitate the quality control of the study program contents and ensuring quality in a long-term. The article deals with two examples of recording the study course topics, using concept classification.

1 INTRODUCTION

European Union and governments call for quality evaluation and the improvement of higher education institutions (HEI), as well as the improvement of HEI study program content and realization (ENQA, 2003; ENQA, 2005). Any activities leading to judgments or recommendations concerning the quality of an institution or of a study program that the institution offers, is encouraged. Evaluation has an internal dimension (self-evaluation) and an external one (conducted by external experts, peers or inspectors). (Kristoffersen, Sursock and Westerheijden, 1998)

When performing quality assessment in the higher education, the key purpose of the evaluation is to ensure improvement and accountability. (Kristoffersen, Sursock and Westerheijden, 1998)

The purpose of the study described in the article is to analyze the current problems in quality control of the study program contents and to offer a solution for recording the study course information of the study program, using concept classification.

2 STUDY COURSE DESCRIPTION

Regardless of the fact that the method for describing the study courses using the learning outcomes has received good response across Europe, the learning outcomes are not elaborated in the largest higher education institutions in Latvia, and according to the observations of the authors, also elsewhere in Europe, but rather enlisting the considered topics is still used in describing the study courses (Adam, 2006; LUIS, 2009).

Currently, in the University of Latvia and in several other Latvian higher educational institutions, the course information is provided as follows:

- General information, i.e., name of the study course, description; authors; prerequisites; the number of contact hours and practical study sessions in the study course;
- Description of topics;
- Bibliography and suggested reading.

In the University of Latvia, as well as in other higher education institutions of Latvia, and, as the authors have observed – also elsewhere in the world, the list of the topics to be considered in the study course is described by merely enlisting these

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topics, i.e. failing to give the analysis of the topic acquisition level, and oftentimes, also the analysis of the extent. The authors did not find a confirmation for that the description of the topics considered in the study course used different methods, which would allow analyzing the contents of the study courses.

For instance, the list of topics considered in the University of Latvia study course "Industry standards" is as follows:

1. Software Engineering Standards
2. Software Requirements Specification
3. Software Design Description
4. Software Testing Documentation
5. Software User Documentation

3 EXISTING PROBLEMS

In analyzing the quality of the contents of the study courses taught in the Faculty of Computing of the University of Latvia, several problems are identified, the solution whereof would allow improving the quality of the study program contents. Following are the most significant of the said problems:

- Control of the study program contents in accordance with the good practice is encumbered, for instance, during study program accreditation. The good practice can include specific requirements of a group of experts towards the contents of the study program, or as it is in case of ICT study programs, correspondence with the Association for Computing Machinery (ACM), the Association for Information Systems (AIS), and Institute of Electrical and Electronics Engineers Computer Society (IEEE-CS) Computer Curriculum 2005, reflecting the modern requirements for IT studies (ACM/IEEE, 2006);
- Encumbered analysis of conformity of the study program contents to the general requirements of the industry or the standard study programs, not only on the level of the study course titles, but also on the levels of the considered topics and of acquisition (heard, understood, practically applied);
- Encumbered rendering of correct information to the stakeholders, for instance, industry representatives, about the existence of certain topics in the study program, such as answering a question about acquisition of a specific topic in the particular study program and the level of acquisition of the topic (heard, understood, practically applied) and extent (by means of study sessions);
- The provision of reciprocal correspondence of the study courses on the level of the topics considered in the study courses is encumbered, i.e., the ability to control that the topics in various study courses do not overlap, as well as the option to control consideration of all of the necessary topics within the framework of the study program;
- Impossible analysis of information about the level of acquisition (heard, understood, practically applied) and extent (by means of study sessions) of the topics considered in the study courses without involving the lectors of the particular study courses;
- Analysis of related study courses is encumbered in establishing the actual study course prerequisites and in identifying the study courses, which consider certain topics from various perspectives;
- Ensuring sustainable quality of the study courses is encumbered in case if changes are introduced in the study courses both by including new study courses and by implementing adjustments to the existing list of topics to be learned.

The authors enlisted the key problems in the analysis of the study program contents, which have been observed by those responsible for elaborating the study programs when performing the analysis of the study program analysis in preparing the study program for accreditation or when demonstrating the study program to the experts during the accreditation process.

The task set forth by the authors is to plan an approach to recording the study course information in a way that it could solve the above-mentioned problems for quality control and provision of the study program contents.

4 CONCEPT CLASSIFICATION

The solution offered by the authors for the quality control of the study program contents and for improvement thereof is based on use of concepts. However concept classification allows to attribute certain keywords for the concept, as well as to arrange them in specific groups and subgroups, thus achieving a multilevel concept classifier. By use of the concept classifier, the description of the study course topics can be supplemented with the relevant record from the concept classifier.

The concept classification also allows solving several problems within the framework of the study program:

- To be able to identify the use of concepts, if differing denominations in the subject language are used to refer to one concepts in various study courses, for instance, User documentation and User manual;
- To be able to identify the use of concepts, if on some occasions the full denomination of the concept is used while in other courses the concept is abbreviated, for instance, SRS and Software Requirements Specification;
- To be able to identify the use of the concepts, if certain concepts are used instead of denominations of concept groups used elsewhere, for instance, System Model and ER model, knowing that ER model is one of the possible system models.

As a sample of concept classification, in continuation of the article, there is a part of an international key word list IEEE software engineering keywords (IEEE-CS):

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D.2 Software Engineering
D.2.0 General
D.2.0.a Protection mechanisms
D.2.0.b Software psychology
… … …
D.2.1 Requirements/Specifications
D.2.1.a Analysis
D.2.1.b Elicitation methods
D.2.1.c Languages
D.2.1.d Management
… … …
D.2.7 Distribution, Maintenance, and Enhancement
D.2.7.a Conversion from sequential to parallel forms
D.2.7.b Corrections
D.2.7.c Documentation
D.2.7.d Enhancement
D.2.7.e Evolving Internet applications
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In order to ensure precise identification of the topics considered in the study courses, a more detailed elaboration of the concepts is permissible, as well as relation of concepts of various groups. For instance, when performing detailed elaboration of the concepts, the classified concept "`D.2.7.c. Documentation`" can be elaborated in detail as:

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D.2.7.c.1. User documentation
D.2.7.c.2. Manual for administration
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However, the relation of concepts of various groups can be used for relating the concepts, if it is necessary for the purposes of information analysis, thus, for instance, the concepts "`D.2.7.c.1. User documentation`" and "`D.2.0.d.12. ANSI/IEEE Std 1063-1987, IEEE Standard for Software User Documentation`" can be related, because the standard mentioned in the ICT sector describes the user documentation in elaboration.

Concept classification is an important step for ensuring the use of information systems for elaboration of a quality control tool of the content of the study program.

5 INFORMATION SYSTEM

Concept classification and use of the relevant classifier allows elaborating an information system for the analysis of the study program content, based on concepts used in the study program. The purpose of the article is not to describe the structure or the principles of operations of such information system, but rather to demonstrate the options, which such information system could ensure.

The information system would provide support in analysis of quality of the study program contents and in the process of accreditation. During the accreditation time of the study program, also the conformance of the study program to certain criteria is examined. For instance, in ICT study program accreditation in Latvian higher education institutions, conformance of the contents is evaluated pursuant to Computing Curriculum 2005 developed by the globally recognized organizations ACM, AIS, and IEEE-SC. Using the concept classification in recording the study program contents and processing the Computing Curriculum, the conformance control can be alleviated. Figure 1 shows a visualization of one possibilities, which would allow identifying the concepts, which are used in the study program, but are not used, for instance, ACM/IEEE Computer Curriculum 2005. And vice versa – the information system would allow identifying the concepts in ACM/IEEE Computer Curriculum 2005, which are not used in the evaluated study program. Similarly, conformance of the study program contents could be evaluated with regards to the requirements of other contents, for instance, requirements established by the industry experts.

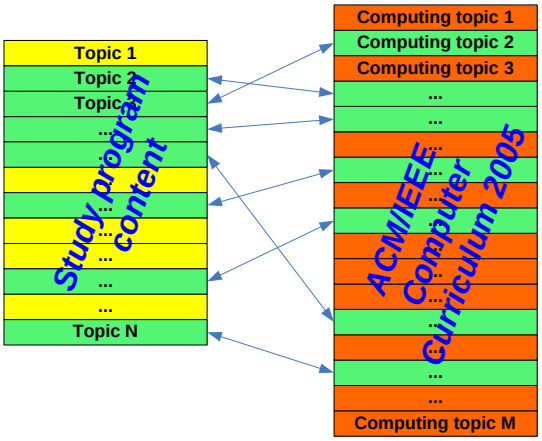

Figure 1: Conformance of the study program contents to ACM/IEEE Computer Curriculum.

The information system would be useful also for daily quality control of the study program contents:

- In identifying those study courses, which use the same or mutually related concepts;
- In searching the study courses, which consider the concept at question, for instance, when the industry representatives are interested in acquiring specific technologies in the study program;
- In identifying the reciprocal connection of the study courses, which would allow the study program developers to control the study course relation, as well as would allow the study course authors to be informed about other study courses, which consider the same topic in a different context;
- In comparison of two or more different study programs, if the used concept classifiers are harmonized;
- When informing the concerned parties or relevant stakeholders about the contents of the study program, when new study courses are added or if the existing study course contents or the level of considering the topic has been changed.

6 STUDY COURSE DESCRIPTION USING CONCEPT CLASSIFIER

When describing the topics of the study courses by use of the concept classifier, the additionally identified requirements in enlisting the topics must be taken into consideration, i.e., identify the level of considering the topic (heard, understood, practically applied) and the extent (by means of study sessions) thereof. In the continuation of the article, the authors are proposing example for describing the study course topics, which employ a slightly distinct approach in using the concepts. The topic title includes the name of the corresponding concept (see Table 1).

The information in the table is displayed in the following columns:

- Description of study course topic
- (1) Number of study sessions in contact hours
- (2) Mark for examination of knowledge about the relevant topic planned within the framework of the study course
- (3) Number of practical sessions in contact hours
- (4) Mark for elaboration of the practical work about the relevant topic planned within the framework of the study course
- (5) The planned extent of student's individual (extramural) work

Table 1: Description of the study topics offered by the authors.

Topic	Study sessions		Practical work		Individual work
	(1)	(2)	(3)	(4)	(5)
General learning about [software requirements specification]	0.25	x			
Executing the [software requirements specification] taking into account the requirements of the standard [ANSI/IEEE std 830-1998]	4	x	2	x	16

In order to ensure analysis of the study program contents, according to the approach described by the authors, it is necessary to do the following:

- Elaborate a concept classifier. As the base for the concept classifier, for instance, relevant term lists elaborated by the industry, which can be supplemented if necessary, can be used;
- Indicate relevant concepts for each study course topic list. If necessary, elaborating the concept classifier developed in the first step in more detail;
- The level of acquisition (heard, understood, practically applied) and the extent (by means of study sessions) must be indicated for each topic.

7 CONCLUSIONS

The purpose of the present study is to plan changes in the description of study course topics, in order to ensure the possibility of performing an analysis of the study courses existing in the study program and control in a long-term.

The described approach is based on use of the concepts in description of the study topics and the authors are setting forth a hypothesis that by describing the study course topics and elaborating the relevant information system, it is possible to prevent the problems identified in the beginning of the article concerning the quality control and provision of the study program contents. Furthermore, with the assistance of an information system, it is possible to manage changes in the study courses and to ensure sustainable quality of the study program.

In continuation of the study, the authors are planning to elaborate an information system prototype for recording and controlling the study program contents in accordance to the approach described in the article, as well as for using the prototype in processing the contents of the study programs of the Faculty of Computing of the University of Latvia.

Regardless of the fact that the article does not touch upon processing of the learning outcome, the authors are considering that it is possible to use concept classification also for describing learning outcome, which would allow for analysis of the learning outcome with the assistance of information systems.

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